

COIN CHUTE FOR USE IN PAYPHONE INSTRUMENTS

The present invention relates to coin-chutes particularly although not exclusively, for use in telephone coin-box instruments known also as payphones.

5 A major problem in such payphones is the efficient utilisation of the available space by the apparatus which is housed within the device.

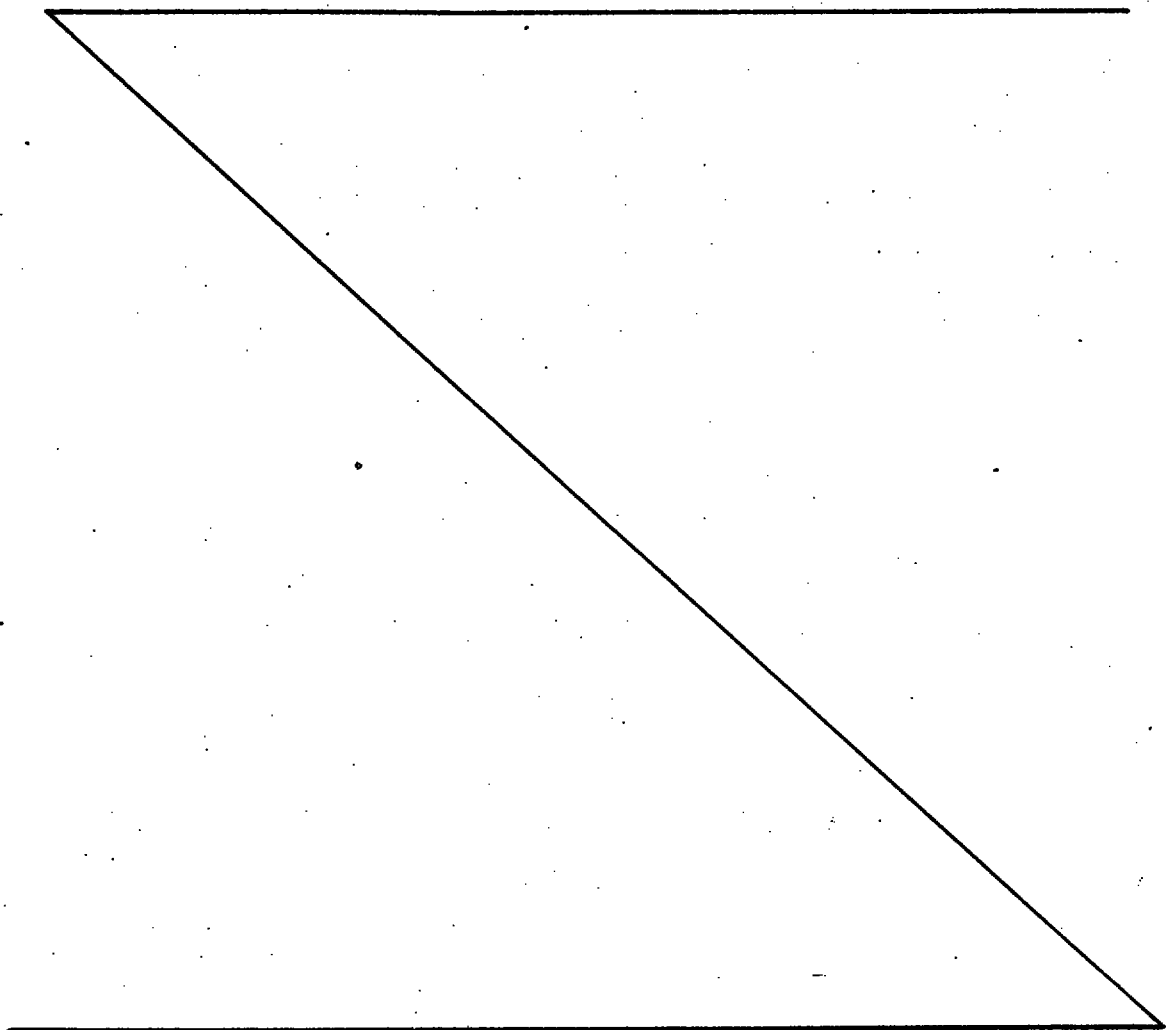
Accordingly it is an object of this invention to provide a coin chute which is adapted to make the most
10 efficient use of space within the payphone while maintaining an efficient operation in the presence of coins.

According to the present invention, there is provided a coin chute comprising first and second runways
15 extending in opposite directions each runway being adapted for the passage of coins by means of gravity, in which the first runway is connected at one of its ends to the second runway at one of its ends and in which at the point of connection of the first and second runways,
20 there is an inclined connecting surface, and a coin impact face which exhibits a high mechanical hysteresis and which has a low coefficient of restitution, whereby when a coin is placed in the first runway, it rolls freely along this runway in one direction and upon
25 reaching the point of connection between the two runways strikes the coin impact face which controls the coin rebound and as the rebound takes effect within space provided at the point of connection, the coin slides down

said inclined connecting surface to enter the second runway whereupon it rolls freely along this runway in a direction opposite to said one direction.

The invention will be more readily understood from the following description of two exemplary embodiments which should be read in conjunction with the accompanying drawings in which:-

Fig. 1. shows a view of part of a payphone, portions of which are cut away to illustrate the positioning of a



typical coin chute within the payphone;

Fig. 2. shows the relevant portions of a coin-chute in accordance with the present invention with certain sections of the walls of the chute cut-away to enable the internal features to be observed;

Fig. 3. shows a section of the chute as shown in Fig. 2 as viewed in the direction of the arrows of section A - A; and,

Fig. 4. shows a further view of the coin-chute in accordance with this invention but with a modification to incorporate a coin store (the walls of the chute are cut-away to enable observation of the internal features).

Referring to Fig. 1. which shows a typical coin-chute 1 located within a payphone. The chute 1 has associated with it coin detection mechanisms such as coin reject 2, validator 3, flushing 4 and cash box/refund 5. A coin store 6 and a refund draw 7 are shown at the lower part of the instrument.

Referring now to Fig. 2. to Fig. 4. of the drawings, it will be seen that the chute comprises a first upper runway 8 and a second lower runway 9. Both runways are inclined to the horizontal by an angle α to enable coins 10 and 11 to pass along and down the runways under the action of gravity.

A coin 10 in the upper runway moves in a first direction of motion A, whereas a coin 11 in the lower runway moves in a second direction of motion B. In effect the coin travelling down the coin chute has a reversal in direction of motion.

The change in direction of motion has to be carefully controlled and is achieved at the junction of the upper and lower runway by means of a specially designed impact face 12 and a connecting surface 13 between both coin runways.

As explained, under the action of gravity a coin entering the upper runway 8, rolls down the runway and strikes the impact face 12. This impact face 12 has a low coefficient of restitution to restrict the coin rebound and accordingly as the coin's controlled rebound takes effect, the coin slides down an inclined connecting surface 13 into the lower runway 8. The coin now rolls down this runway also under the action of gravity.

The material used at the impact face 12 must exhibit a high mechanical hysteresis and an example of such a material is Neoprene rubber. This can be bonded to a backing material which can be an integral part of the runway moulding. Alternatively a soft P.V.C. can be used, coated on Aluminium, or even a loose fitting insert of plastics or metal exhibiting pendulum damping (the material absorbs some of the energy of the impacting coin), may be used.

It is important to note that the rebound dimension x, between the impact face 12 and face 14 of the joining inside walls of the two runways, is defined by the following formula:-

$$X \text{ minimum} = \frac{(e V)^2}{2g (\sin \alpha + \mu \cos \alpha)}$$

where e = coefficient of restitution

(17)

- μ = coefficient of friction
- V = velocity of impact
- g = acceleration due to gravity
- α = runway angle

5 This formula is derived as follows:-

At the instant of rebound of the coin, it should be assumed that the velocity is equal to V_1 and that it reduces to zero through a rebound distance x .

10 Now, the retarding force of the coin = mass $\times$ acceleration. If also it is assumed that w is the weight of the coin perpendicularly downwards on the runway, which is inclined at an angle α to the horizontal, and μ is the coefficient of friction, then

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$$W \sin \alpha + \mu W \cos \alpha = \frac{W}{g} \times \text{acceleration}$$

where g is the acceleration of the coin due to gravity.

$$\therefore \text{acceleration} = g (\sin \alpha + \mu \cos \alpha)$$

20 by substitution,
$$\frac{V_1^2}{2x} = g (\sin \alpha + \mu \cos \alpha)$$

$$\therefore x = \frac{V_1^2}{2g (\sin \alpha + \mu \cos \alpha)}$$

25 If velocity = V and the coefficient of restitution of the impact face = e

then $V_1 = eV$

$$\text{and } x = \frac{(ev)^2}{2g (\sin \alpha + \mu \cos \alpha)}$$

As previously stated.

5 The angle β that the chute takes up from the vertical, is necessary to ensure that coins passing down the runways remain in abutment with one of the runway walls only. This is to enable correct detection of the passage of coins by coin detection mechanisms adjacent these walls.

10 In the modified coin-chute shown in Fig. 4 there is provided a step-down area 15 of sufficient size to accommodate a certain number of coins to enable a degree of coin-storage. It will be seen that the floor of the lower runway 16 from the impact face 12 is a steeper
15 angle than the lower runway itself. This is to prevent coin blockage.

(15)



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CLAIMS:-

1. A coin chute comprising first and second runways extending in opposite directions each runway being adapted for the passage of coins by means of gravity, in which the first runway is connected at one of its ends to the second runway at one of its ends and in which at the point of connection of the first and second runways, there is an inclined connecting surface, and a coin impact face which exhibits a high mechanical hysteresis and which has a low coefficient of restitution, whereby when a coin is placed in the first runway, it rolls freely along this runway in one direction and upon reaching the point of connection between the two runways strikes the coin impact face which controls the coin rebound and as the rebound takes effect within space provided at the point of connection, the coin slides down said inclined connecting surface to enter the second runway whereupon it rolls freely along this runway in a direction opposite to said one direction.
2. A coin chute as claimed in claim 1, in which the said material is synthetic rubber which is bonded to a backing material and which forms an integral part of the coin chute runways.
3. A coin chute as claimed in claim 1, in which the said material is a loose fitting insert of plastics or metal exhibiting pendulum damping.
4. A coin chute as claimed in claim 1, in which said material is aluminium coated polyvinyl chloride (P.V.C.).



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5. A coin chute as claimed in any preceding claim, in which the first and second runways are both inclined to the horizontal by the same acute angle (α).

5 6. A coin chute as claimed in any preceding claim, in which the coin chute is inclined from the vertical by an acute angle (β) to ensure that coins moving down said first and second runways remain in abutment with one of the runway walls.

10 7. A coin chute as claimed in any preceding claim, in which at the point of connection of the first and second runways and adjacent the inclined connecting surface there is provided a step-down area for coin storage.

15 8. A telephone coin box instrument substantially as described with reference to, and as shown, in Figure 1 of the accompanying drawings.

9. A coin chute substantially as described, with reference to, and as shown, in Figures 1, 2 and 3 of the accompanying drawings.

20 10. A coin chute substantially as described, with reference to, and as shown in Figure 4 of the accompanying drawings.